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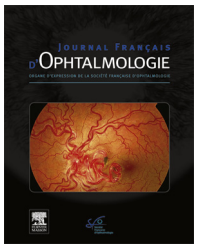

ORIGINAL ARTICLE

Simultaneous penetrating keratoplasty and amniotic membrane transplantation in eyes with a history of limbal stem cell deficiency

Kératoplastie transfixiante combinée à une greffe de membrane amniotique au cours du syndrome d'insuffisance en cellules souches limbiques

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KEYWORDS
Amniotic membrane transplantation;
Epithelial defect;
Graft survival;
Keratoplasty;
Limbal stem cell deficiency

Summary
Purpose. — To describe the outcomes of simultaneous penetrating keratoplasty (PK) and amniotic membrane transplantation (AMT) performed both as a ring-shaped graft and as a temporary patch in eyes with a history of limbal stem cell deficiency (LSCD).
Methods. — Prospective observational case series including 48 simultaneous PK/AMT procedures (48 patients) in eyes with a history of partial or total LSCD. Patients with total LSCD were first treated with limbal stem cell transplantation. The preoperative indication was graft failure in 58.3% of cases. Most recipients (89.6%) were at high-risk for rejection.
Results. — The mean graft reepithelialization time was 29.2 ± 30.8 days. Graft reepithelialization was achieved in 30 days in 70.8% of cases. No AMT-related adverse events were observed. The mean time from keratoplasty-to-last visit was 84.5 ± 54.5 months. The 3-year graft survival rate was 62.5%. Recurrence of corneal epithelial defects after graft reepithelialization (47.9%) was associated with lower graft survival ($P = 0.004$). In eyes with successful grafts at the last visit, the mean LogMAR visual acuity was 1.90 (20/1575) ± 5 lines before keratoplasty and 0.89 (20/155) ± 10 lines at 5 years. A ring of amniotic membrane was visible between the graft stroma and the corneal epithelium on slit-lamp examination and optical coherence tomography in all successful cases.

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Conclusions. — In this series of eyes with a history of LSCD and at high-risk of rejection, simultaneous PK and AMT were associated with satisfactory graft survival and no additional adverse events.

MOTS CLÉS
Greffe de membrane amniotique ;
Kératoplastie ;
Déficit en cellules souches limbiques

Résumé
Introduction. — Notre but est de rapporter les résultats de la kératoplastie transfixiante (KT) combinée à une greffe de membrane amniotique (GMA) en anneau et en patch temporaire au cours du déficit en cellules souches limbiques (DCSL).
Matériel et méthodes. — Il s'agit d'une série prospective observationnelle incluant 48 chirurgies combinées KT/GMA (48 patients) réalisées dans des yeux ayant des antécédents de DCSL partiel ou total. Les patients ayant un DCSL total ont été traités préalablement par une greffe de cellules souches limbiques. L'indication de la greffe était un échec de greffe dans 58,3 % des cas. La plupart des receveurs (89,6 %) étaient à haut risque de rejet.
Résultats. — Le temps moyen de réépithélialisation du greffon était de 29,2 ± 30,8 jours. Le greffon était réépithélialisé au cours du premier mois dans 70,8 % des cas. Aucun effet indésirable lié à la GMA n'a été observé. Le délai moyen entre la greffe et la dernière visite était de 84,5 ± 54,5 mois. Le taux de survie du greffon à 3 ans était de 62,5 %. La récurrence de défects épithéliaux après réépithélialisation du greffon (47,9 %) était associée à une survie du greffon diminuée ($p = 0{,}004$). En cas de présence d'un greffon clair lors de la dernière visite, l'acuité visuelle LogMAR moyenne était de 1,90 (0,013) ± 5 lignes avant greffe et 0,89 (0,13) ± 10 lignes à 5 ans. Un anneau de membrane amniotique était visible à la lampe à fente et en tomographie à cohérence optique entre le stroma du greffon et l'épithélium cornéen dans tous les cas de succès de la greffe.
Conclusions. — Dans cette série de yeux à haut risque de rejet ayant un DCSL, la chirurgie combine KT/GMA a permis une survie du greffon satisfaisante sans créer d'effet indésirable supplémentaire.

Introduction

Reepithelialization of corneal graft is an important step after penetrating keratoplasty (PK). Post-keratoplasty persistent corneal epithelial defects and chronic ulcer are common in eyes with impaired limbal stem cell function [1]. Diagnosis of limbal stem cell deficiency (LSCD) can be made on clinical features such as late and irregular fluorescein staining of the corneal epithelium, persistent epithelial defects (PED), and superficial corneal vascularization [2]. Confocal microscopy, impression specimen cytology, and histology can provide evidence of LSCD by showing presence of goblet cells in the corneal epithelium [3—6]. Long standing epithelial defects are associated with increased risk of infectious keratitis and stromal melting [7]. They may lead to corneal scarring, thinning, neovascularization, and progressive stromal ulceration. Perforation may complicate this severe corneal condition and lead to loss of the eyeball.

Eyes with a history of LSCD requiring keratoplasty for optical indication are at high-risk of postoperative epithelial complications [8]. In addition they are often at high-risk of rejection due to previous development of stromal vascularization and/or failure of conventional keratoplasty. In these high-risk eyes featuring a history of irreversible graft rejection or at least 2 quadrants of stromal vascularization, high postoperative steroid regimen is necessary to prevent graft rejection [9]. However this steroid regimen is associated with longer graft reepithelialization [10].

The past two decades have witnessed the revival of amniotic membrane (AM) transplantation [11]. AM has numerous properties that render it extremely useful in ocular surgery. It has been shown to promote epithelialization, to inhibit fibrosis, inflammation and angiogenesis, and to feature antibacterial properties [12—18]. Due to all these properties, AM was used for treating persistent epithelial defects (PED) with a reported success rate ranging from 50% to 90% [12,19—22].

In the context of penetrating keratoplasty, AM transplantation can improve PED healing before or after keratoplasty [23,24]. AM transplantation may also prevent PED occurrence when combined with penetrating keratoplasty, thus preventing several post-keratoplasty complications (i.e., corneal ulcer, stromal scars, and infectious keratitis).

In high-risk recipients, the results reported by Seitz and al. suggest a better short and intermediate term prognosis after simultaneous AM transplantation (temporary patch) and PK than after non-combined PK procedure [25,26]. We hypothesized that simultaneous PK and AM transplantation